EASTERN PACIFIC SNAKE-EELS OF THE GENUS *CALLECHELYS* (APODES: OPHICHTHIDAE)

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ABSTRACT.—Three species of *Callechelys* are recognized from the eastern tropical Pacific. Two, **C. eristigmus** and **C. galapagensis**, are described as new. *Callechelys cliffi* Böhlke and Briggs is redescribed from adults. The species differ in coloration, body proportions and vertebral number. *Callechelys cliffi* and **C. eristigmus** n. sp. range from Panama to the Gulf of California, and **C. galapagensis** is known only from the Galapagos Islands. Vertebral number and proportional tail length of the 15 species of *Callechelys* are given. Lineages within the genus are indicated by the presence or absence of a scapula and the condition of the urohyal.

Callechelys is one of the larger genera of the Ophichthidae with fifteen species, mainly limited to the tropics. The species are distinguished on the basis of coloration, vertebral number, and certain body proportions, mainly body depth and preanal distance. Like most snake-eels, members of the genus are sand dwelling and restricted to continental shelf depths. Some of the species attain lengths of one meter. It is not known whether they occupy burrows or wander extensively through the sand. Despite the sand-dwelling habit, many of the species are boldly marked. It is possible that they leave the sand at night, and the color pattern may have significance at these times. Occasional specimens have indeed been taken at the surface under lights at night.

When Storey (1939) published her revision of *Callechelys*, a single specimen, doubtfully referred to *C. marmoratus* or *C. luteus,* was known from the eastern tropical Pacific. Subsequently (Böhlke and Briggs, 1954) another specimen was taken and made the holotype of a new species. The collections at the Scripps Institution of Oceanography, the Department of Zoology, University of California, Los Angeles, and the University of Costa Rica now contain 55 eastern Pacific specimens of *Callechelys.* The recent collections of these eels are attributable to the development of synergized emulsified rotenone products. The use of these products has resulted in rich collections of ophichthid eels and other sand-dwelling fishes not obtainable with powdered derris root. Even with the use of powerful ichthyocides, the collection of these eels is not easy. Either because of a resistance to rotenone or the time involved in transport of rotenone down into the sand, they emerge long after most fishes are dead. Ophichthids may begin to appear after other fishes have been picked up and the station apparently completed.

Our material can be separated into three species, only one of which has been described. *Callechelys cliffi* Böhlke and Briggs, heretofore known only from the just-transformed holotype, can now be described on the basis of adult characters.

MATERIALS AND METHODS

Material used in this study is housed in the following institutions: University of California at Los Angeles, Department of Zoology (UCLA); National Museum of Natural History (USNM); California Academy of Sciences, material previously at Stanford University, (SU); Universidad de Costa Rica, Museo de Zoologia (UCR); and Scripps Institution of Oceanography (SIO). Paratypes of *Callechelys eristigmus* will be deposited at the Academy of Natural Sciences of Philadelphia and the USNM.

All measurements are straight-line measurements, made either with a 300 mm ruler with 0.5 mm gradations (for standard length, trunk length, and tail length) and recorded to the nearest 0.5 mm, or with dial calipers (all other measurements) and recorded to the nearest 0.1 mm. Head length is measured from the snout tip to the posterodorsal margin of the gill opening; trunk length is taken from the end of the head to mid-anus; body

depth does not include the fin. Counts and proportions in Tables 2-4 include the mean, range, and 95% confidence limits of the mean. Fin ray and vertebral counts (which include the hypural) were made using radiographs or cleared and stained specimens.

Callechelys Kaup, 1856

The genus *Callechelys* may be distinguished from all other ophichthid genera on the basis of the following combination of characters: tip of tail a hard point; pectorals absent; anal fin present; dorsal fin originating on head; head and body laterally compressed; anterior nostrils tubular; a median groove on underside of snout; gill openings low-lateral and converging forward, the isthmus much narrower than the gill opening length; intermaxillary and vomerine teeth present, canine teeth absent.

Key to the Eastern Pacific Species of Callechelys

1a. Tail considerably shorter than head and trunk, 3.25-3.75 in total length. Greatest body depth of adults 3.3-3.5 times in head length. Color pattern of strongly contrasted round dark spots about as long as snout.
Vertebrae 154-163 ..... *Callechelys eristigmus* n. sp.

1b. Tail almost equal to head and trunk, 2.2-2.4 in total length. Greatest body depth of adults 1.7-2.8 times in head length. Color pattern either solely of numerous small dark spots, or with larger dark oblongs as well, in which case the total vertebrae are 170-174 2

2a. Color pattern of numerous fine spots, not much larger than eye diameter, fins with a distinct white edge. Vertebrate 149-158 ..... *Callechelys cliffi* Böhlke and Briggs

2b. Color pattern with oblong blotches varying in size between an eye diameter and a snout length along the major axis, fins without a white edging.
Vertebrae 170-174 ..... *Callechelys galapagensis* n. sp.

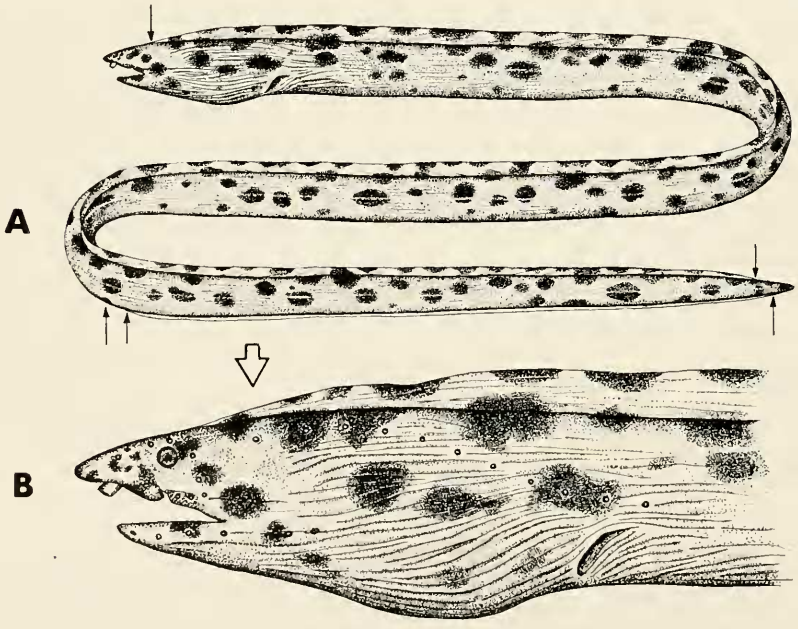

Figure 1a. *Callechelys eristigmus* n. sp., holotype, SIO 65-263, 503.5 mm total length. b. Head region of holotype of *Callechelys eristigmus* n. sp. Arrow indicates true dorsal fin origin.

Callechelys eristigmus n. sp.

Figs. 1, 2a, 5; Tables 1, 2, 5

Description of holotype.—Counts and proportions of the holotype are given in Table 1. Proportions of the holotype and 29 paratypes are given in Table 2.

Body laterally compressed throughout its length, tapering posteriorly to a hard fin-

Table 1. Counts, and proportions in thousandths, of the holotypes of the eastern Pacific species of *Callechelys*.

	C. cliffi	*C. eristigmus*	*C. galapagensis*
Total length (mm)	93.5	503.5	818.0
Total vertebrae	155	159	172
Preanal vertebrae		105	92
	(thousandths of total length)		
Head	101	72	74
Trunk	467	628	483
Tail	433	300	444
	(thousandths of head length)		
Dorsal fin origin	606	318	312
Snout	170	142	133
Upper jaw	340	285	262
Eye	74	41	46
Interorbital		132	108
Isthmus	74	55	119
Depth behind gill opening	351	345	464
Width behind gill opening		249	265
Depth at anus	330	258	365
Width at anus		195	249
Gill opening length		145	202

less point. Depth behind gill openings 40 times and at anus 51 times in total length; width behind gill openings 55 and at anus 71 in total length. Head and trunk 1.4, head 13.8 in total length. Snout acute, rounded at tip. Lower jaw included, its tip slightly before eye and midway between anterior and posterior nostrils. Eye small, about as long as tube of anterior nostril. Posterior nostrils open into mouth although their distal edges are open to the outer edge of lip, visible externally as a slit. Surface of head, trunk and tail markedly wrinkled (except top and sides of anterior portion of head smooth), with approximately 30 longitudinal grooves on each side of body. Tongue adnate. Branchial basket expanded, supported by 31 pairs of branchiostegals and jugostegalia which broadly overlap along ventral midline. Urohyal simple, a single slender filament posteriorly. Tip of lower jaw and lateral skin folds of upper jaw covered with numerous papillae (Fig. 2a).

Teeth small and pointed (Fig. 2a), uniserial in jaws. An anterior intermaxillary tooth-pair covered by skin folds for most of their length, followed by seven vomerine teeth that become biserial posteriorly.

Preoperculomandibular, temporal, postorbital, suborbital, and supraorbital series of pores present (Fig. 1b). Lateral line beginning on head with 10 pores before gill opening (lateral line canal and pores difficult to discern due to skin folds and waxy precipitate which forms on preserved specimens). Total right lateral line pores of the cleared and stained specimen 140, 92 before anus. Last pore ca. 0.15 head lengths before tail tip. Dorsal fin origin on head, above and slightly behind rictus; median fins end about a snout length before tail tip. Fin rays in dorsal 498, anal 143 (counted from the cleared and stained paratype).

Gill arches and hyoid apparatus of two paratypes removed and stained. First basibranchial ossified, second cartilaginous, third and fourth absent. Hypobranchials 1-2 ossified, third cartilaginous. Ceratobranchials 1-4 ossified, fifth absent. Infrapharyngobranchials 2-3 ossified. Lower pharyngeal teeth in elongate patches on fourth ceratobranchial and extend onto hypobranchial; upper pharyngeal tooth plate smaller, attached to distal ends of epibranchials 2-4 and second infrapharyngobranchial (I_3 of Nelson, 1966).

Color in alcohol mostly cream, overlain with numerous dark spots that extend onto the dorsal fin membrane. Chin, throat, and venter often spotted, but always less so than dorsum. Spots on nape and snout smaller (nearly as large as eye).

Etymology.—From the Greek ερι (eri), intensive participle, and στιγμα (stigma), spot, in reference to the distinctive coloration; regarded as an adjective.

Remarks.—Gulf of California specimens are inseparable on the basis of coloration and morphology from those from southern localities (Cocos Island, Costa Rica, and Panama). The mean vertebral number of specimens from these localities (158.3 for 29 Mexican specimens, 156.1 for 8 specimens from the south) are significantly different (P = .05 by t test); however, the degree of joint non-overlap is not sufficient to warrant taxonomic recognition.

Table 2. *Callechelys eristigmus* n. sp., counts, and proportions in thousandths, of holotype and 29 paratypes; mean, 95% confidence limits of the mean, and range.

	$\overline{X}$	*95% C. L.*	*range*
Total length (mm)			284-1126mm
Vertebrae (37 specimens)	157.9	157.2-158.5	154-163
		(thousandths of total length)	
Head	76	74-77	67-83
Trunk	628	624-632	610-662
Tail	295	291-299	268-309
		(thousandths of head length)	
Dorsal fin origin	327	316-337	250-379
Snout	152	149-155	135-167
Upper jaw	266	260-272	228-289
Eye	46	44-48	34-56
Interorbital	113	109-117	98-140
Left gill opening length	142	136-147	111-168
Isthmus	58	54-61	46-77
Depth behind gill opening	295	286-304	254-345
Depth at anus	250	237-262	172-338
Width behind gill opening	194	185-203	144-272
Width at anus	182	174-190	140-234

Material examined.—Holotype: SIO 65-263, a 503.5 mm adult from Isla San José, Gulf of California, Baja California Sur (24°52′15″N, 110°37′00″W). Taken with rotenone and SCUBA in depths of 20-25 m on a sand and boulder bottom by R. H. Rosenblatt and party on 7 July 1965. Paratypes: all collected using rotenone ichthyocides in relatively shallow water (5-25 m), generally over a sand and rock bottom. Panama-Islas Secas, Isla Cavada, SIO 70-136, 2(359-465); Islas Secas, Isla Seca, 70-140, 2(342-450). Costa Rica-Isla del Coco, UCLA 58-378, 1(361); Isla del Caño, UCR 423-126, 5(216-491). Gulf of California, Baja California Sur—Isla Carmen, UCLA 65-77, 3(325-420), SIO 65-299, 2(328-357); Isla Santa Catalina, SIO 65-337, 2(411-469); Isla Santa Cruz, SIO 65-342, 2(408-420), SIO 65-354, 2(431-498, the smaller specimen cleared and stained); Punta Nopolo, SIO 65-270, 1(564); Isla San José, SIO 65-263, 1(323, collected with the holotype), SIO 65-260, 1(372); Isla Espíritu Santo, SIO 61-277, 1(1126); Bahía de los Lobos, SIO 61-279, 1(418); Isla Ceralbo, SIO 61-256, 1(494), SIO 61-259, 2(399-493); Bahía de Palmas, UCLA 59-249, 1(285), UCLA 59-251, 2(284-538); Punta Pescadero, SIO 61-252, 2(317-557); Punta Los Frailes, SIO 61-239, 1(425); El Tule Ranch, east of Cabo San Lucas, SIO 65-185, 3(363-552).

Callechelys galapagensis, n. sp.

Figs. 2b, 3, 5; Tables 1, 3, 5

Callechelys marmoratus, nec Bleeker, Fowler, 1932: 3. Fowler, 1938: 251.
Callechelys luteus, nec Synder, Storey, 1939: 69.

Description of holotype.—Counts and proportions of the holotype are given in Table 1. Proportions of the holotype and 3 paratypes are given in Table 3.

Body laterally compressed throughout its length, tapering posteriorly to a hard finless point. Depth behind gill openings 29 times and at anus 37 in total length; width behind gill openings 51 and at anus 54.5 in total length. Head and trunk 1.8, head 13.5 in total length. Snout acute, rounded at tip. Lower jaw included, its tip closer to base of anterior nostrils than to a vertical from anterior margin of eye. Eye small, about equal in length to tube of anterior nostril. Posterior nostrils open into mouth, visible externally as a slit. Surface of head and trunk markedly wrinkled (except top and sides of anterior por-

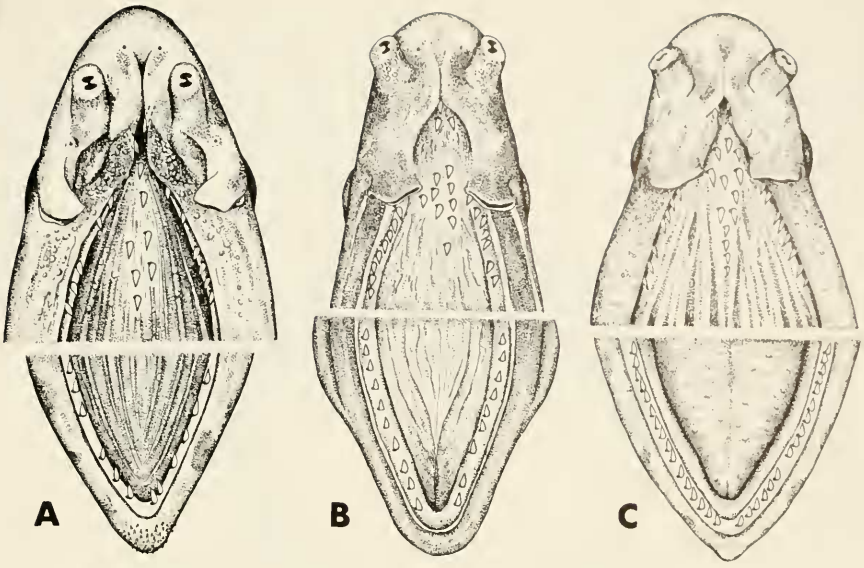

Figure 2a. Dentition of holotype of *Callechelys eristigmus*. b. *Callechelys galapagensis*, n. sp., a paratype, UCLA 67-33. c. *Callechelys cliffi*, SIO 62-42.

tion of head smooth) as in *C. eristigmus*, but becoming smoother posteriorly. Tongue adnate. Branchial basket expanded, supported by 26 pairs of branchiostegals and jugostegalia which broadly overlap along ventral midline. Urohyal split into two slender filaments for about 90% of its length. Tip of lower jaw and lateral skin folds of upper jaw papillose, as in *C. eristigmus*.

Teeth small and pointed (Fig. 2b). Intermaxillary teeth comprising two or three pairs partially covered by skin folds, largest anteriorly, followed by from four to six pairs of biserial vomerine teeth. Lower jaw teeth uniserial and small, about 10 to 15 on each side.

Preoperculomandibular, temporal, postorbital, suborbital, and supraorbital series of head pores present, not unlike those of *C. eristigmus* (Fig. 1b) in number and position. Lateral line (of the left side of holotype) beginning on head, with 10 pores before gill opening, 87 to anus, and 157 total pores ending 0.2 head lengths from tail tip. Dorsal fin origin on head, above and slightly behind rictus; median fins ending less than a snout

Table 3. ***Callechelys galapagensis*** n. sp., counts, and proportions in thousandths, of holotype and 3 paratypes; mean, and 95% confidence limits of the mean, and range.

	$\overline{X}$	*95% C. L.*	*range*
Total length (mm)			248-818 mm
Vertebrae	172	169.4-174.6	170-174
		(thousandths of total length)	
Head	76	67-85	69-82
Trunk	478	456-499	463-494
Tail	444	432-456	437-455
		(thousandths of head length)	
Dorsal fin origin	325	293-357	312-355
Snout	132	127-138	128-137
Upper jaw	248	194-302	197-269
Eye	55	42-68	46-66
Interorbital	103	80-126	81-112
Left gill opening length	178	115-240	127-214
Isthmus	109	71-148	76-133
Depth behind gill opening	418	293-544	349-506
Depth at anus	352	226-479	289-460
Width behind gill opening	252	170-334	203-319
Width at anus	226	158-293	178-272

length before tail tip. Fin rays in dorsal 520, anal 230 (counted from a radiograph of holotype).

Gill arches and hyoid apparatus of the largest paratype (UCLA 64-40) removed and stained. Configuration and condition of the gill arch members like that of *C. eristigmus* except that the upper and lower pharyngeal tooth plates are nearly equal in length, and oblong rather than elongate (the lower pharyngeal plate of *C. eristigmus* is larger and more slender than the upper).

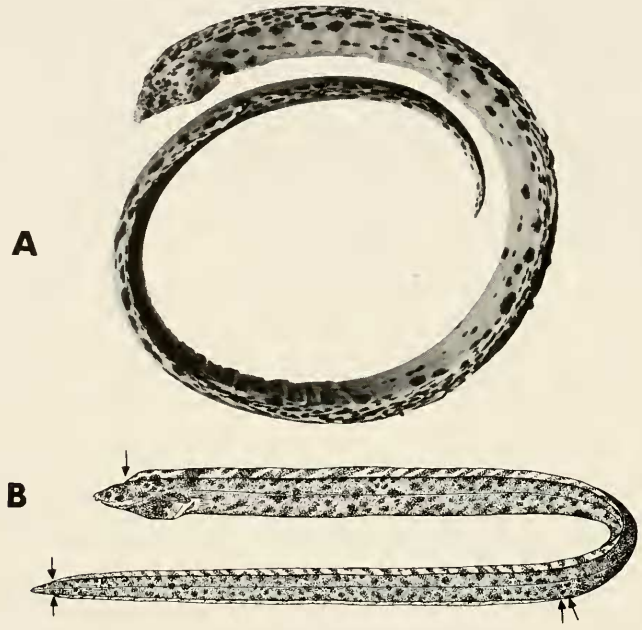

Figure 3a. *Callechelys galapagensis* n. sp., paratype, UCLA 64-40, 767 mm total length. b. *Callechelys galapagensis* n. sp., a darkly colored paratype, UCLA 67-33, 248 mm total length.

Color in alcohol mostly cream, overlain with numerous dark oblong markings that vary in length from the size of the eye to the length of the upper jaw. These spots extend onto median fins and become densely aggregated on chin and top and sides of head. Ventral and dorsal surfaces more spotted than flanks, which have a row of small spots unevenly distributed along midline. The smallest paratype (Fig. 3b) differs from the other types in having a chocolate brown background coloration, although the spotting is similar.

Etymology.—Named *galapagensis*, for the locality at which all known specimens were collected.

Material examined.—Holotype: SIO 72-1, formerly UCLA 64-39, an 818 mm adult from the Galapagos Islands, Isla Santa Cruz, north shore, off small cove. Taken with Chemfish and SCUBA over a sand, rock, and sparse coral bottom in ten meters by B. W. Walker and E. S. Hobson on 24 February 1964. Paratypes: all from the Galapagos Islands. USNM 89728, 1(312), Isla Santa Maria, Black Beach Anchorage. UCLA 64-40, 1(767), Isla Santa Cruz, North Coast. UCLA 67-33, 1(248), Isla San Salvador, James Bay.

Callechelys cliffi Böhlke and Briggs
Figs. 2c, 4, 5; Tables 1, 4, 5

Callechelys cliffi Böhlke and Briggs, 1954: 275. Fraile Bay (Los Frailes), Gulf of California.

Description.—Counts and proportions of the holotype are given in Table 1. Proportions of several juvenile and adult specimens are given in Table 4. The following description is based on the adult specimens.

Body laterally compressed throughout its length, tapering posteriorly to a point. Depth behind gill openings 23 times and at anus 27 in total length; width behind gill openings 43.5 and at anus 45 in total length. Head and trunk 1.7, head 10.7 in total length. Snout acute, rounded at tip. Lower jaw included, tip reaches level of anterior nostrils. Eye small, about as long as anterior nostril base. Posterior nostrils open into mouth, visible externally as a slit. Surface of head, trunk, and tail wrinkled (except top and sides of anterior portion of head smooth), becoming smoother on flanks posteriorly, as in *C. galapagensis*. Tongue adnate. Branchial basket expanded, supported by 26 pairs of branchiostegals and jugostegalia which broadly overlap along ventral midline. Urohyal split into two slender filaments for ca. 80% of its length. Tip of lower jaw and anterolateral skin folds of upper jaw lightly papillose (Fig. 2c).

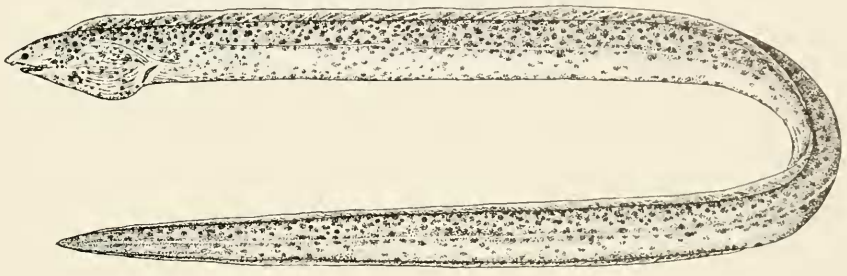

Figure 4. Adult of *Callechelys cliffi*, SIO 62-42, 455 mm total length.

Teeth small and pointed (Fig. 2c) uniserial in jaws. Two anterior pairs of intermaxillary teeth hidden by skin folds of underside of snout, followed by a patch of six to seven intermaxillary teeth joined posteriorly to uniserial vomerine row.

Preoperculomandibular, temporal, postorbital, and supraorbital pore series present. Lateral line beginning on head with ten pores before gill opening, 86 to anus, and 151 total pores, ending 0.3 head lengths from tail tip (SIO 62-42). Dorsal fin origin on head, above and slightly behind rictus; median fins end about a snout length before tail tip. Fin rays in dorsal 457, anal 205 (from radiograph of UCLA 63-45).

Gill arches and hyoid apparatus of two specimens (SIO 61-247, 65-281) removed and stained. The configuration and condition of the gill arch members is similar to that of *C. galapagensis* (see description) in that the upper and lower pharyngeal tooth plates are nearly equal in length and oblong, rather than elongate and unequal as in *C. eristigmus*.

Color in alcohol tan, overlain with numerous fine brown spots on body and fins. Median fins margined in white. Tips of snout, lower jaw, and tail cream-colored.

Table 4. *Callechelys cliffi* Böhlke and Briggs, counts, and proportions in thousandths, mean, 95% confidence limits of the mean, and range.

	$\overline{X}$	*95% C. L.*	*range*	*n*
Total length (mm)			97.5-455 mm	8
			154-455 mm	5
Vertebrae	154.9	153.4-156.5	149-158	14
	(thousandths of total length)			
Head	93	84-101	77-108	8
Trunk	474	459-488	441-496	8
Tail	434	426-442	418-450	8
	(thousandths of head length)			
Dorsal fin origin	413	351-474	363-480	5
Snout	142	123-161	121-170	5
Upper jaw	311	294-329	294-340	5
Eye	61	54-68	53-74	5
Isthmus	97	79-115	74-115	5
Depth behind gill opening	494	416-573	351-568	5
Depth at anus	429	370-488	330-502	5

Remarks.—Our material includes a single collection (SIO 67-40) which contains a series of individuals from newly settled juveniles to adults. This series displays the juvenile to adult color transformation and was compared with the holotype of *C. cliffi*. Smaller specimens in the series were identical with the type in coloration, pore pattern, and morphometry.

Material examined.—Mexico, Baja California Sur, Golfo de California—Bahía Los Frailes, SU 47521, 1(93.5 mm), the holotype. Punta Pulmo, SIO 61-247, 1(218). Punta San Telmo, SIO 65-281, 1(298). Buena Vista, UCLA 63-45, 1(382). Mexico, Nayarit, Bahía de Banderas, SIO 62-42, 1(455). Panama, Archipielago de las Perlas, Isla Saboga, SIO 67-40, 9(80-154).

DISCUSSION

We recognize 15 tropical and subtropical species in the genus *Callechelys*. *C. guichenoti* Kaup, the generic type, is considered by us to be a junior synonym of *C. marmoratus* (Bleeker, 1853). Kaup's (1856) description and Pellegrin's (1912) redescription of the type of *C. guichenoti*, a 475 mm specimen from Tahiti, do not separate it from adults of *C. marmoratus*. Furthermore, recent extensive collecting efforts in Tahiti and the Southern Caroline Archipelago (by the Vanderbilt Foundation, J. E. Randall, and others) using improved ichthyocides have obtained numerous specimens of *C. marmoratus* and *C. melanotaenius* Bleeker. It is highly unlikely that *C. guichenoti*, if indeed distinct, would not have been taken in the various habitats sampled. Smith (1957: 838; 1962) also suspected *C. guichenoti* to be a synonym of *C. marmoratus*, but was incorrect in considering *C. luteus* Snyder conspecific with *C. marmoratus*.

Table 5. Vertebral number and tail length of the species of *Callechelys*.

	Tail/SL	*Vertebrae*[1]	*Location*	*Source*
C. bilinearis Kanazawa	.364[2]	162	West Atlantic	Kanazawa, 1952; this study
C. bitaeniatus (Peters)	.385		E. Africa, Mombasa	Storey, 1939
C. cliffi Böhlke & Briggs	.434	155	Eastern Pacific	this study
C. eristigmus sp. nov.	.295	158	Eastern Pacific	this study
C. galapagensis sp. nov.	.444	172	Galapagos Is.	this study
C. holochromus (Ginsburg)	.333		Gulf of Mexico	Ginsburg, 1951
C. leucopterus (Cadenat)	.431-.475	164	Eastern Atlantic	Blache and Cadenat, 1971
C. luteus Snyder	.415	213	Hawaii	Gosline, 1951
C. marmoratus (Bleeker)	.345[2]	180	West Pacific	Storey, 1939; this study
C. melanotaenius Bleeker	.282[2]	203	West Pacific	Storey, 1939; this study
C. muraena Jordan & Evermann	.385[2]	141[2]	West Atlantic	Storey, 1939; this study
C. nebulosus Smith	.408	159	Red Sea	this study
C. perryae Storey	.328	178[2]	Gulf of Mexico	Storey, 1939; Blache and Cadenat, 1971
C. perryae Storey	.310	179	Eastern Atlantic	Blache and Cadenat, 1971
C. springeri (Ginsburg)	.350	170[2]	Gulf of Mexico	Ginsburg 1951
C. striatus Smith	.304	192	Red Sea	this study

[1]Rounded mean value

[2]Type specimen

Characters currently used for species separation in this genus include the coloration, body depth, preanal length, and vertebral number (Table 5). The angle of the gill opening, sometimes used as a character (Storey 1939), is of little use, because of variability. The species most closely related to the eastern Pacific species *C. cliffi* and *C. eristigmus* appear to be *C. muraena* Jordan and Evermann and *C. perryae* Storey, respectively. The remarkable similarity of each species pair is evidenced in the body depth and taper, coloration, preanal length, and certain osteological characters. The members of each pair are, however, separable by vertebral number. A preliminary osteological study of several species of *Callechelys* and closely related genera has revealed trenchant differences in the urohyal and pectoral girdle. The urohyal is either a simple slender filament (in *C. eristigmus*, *C. marmoratus*, and *C. melanotaenius*) or is split posteriorly into two slender diver-

Figure 5. Distribution of the eastern Pacific species of *Callechelys*.

gent rays (in *C. cliffi*, *C. galapagensis*, and *C. muraena*). The pectoral girdle, as in most ophichthids that lack pectoral fins, is quite reduced, consisting of a slender cleithrum, supracleithrum, and small rodlike coracoid and scapula (?). Certain species of *Callechelys* (*C. eristigmus*, *C. marmoratus*, and *C. melanotaenius*) however, have lost the scapula, whereas others (*C. bilinearis*, *C. cliffi*, *C. galapagensis*, *C. luteus*, *C. muraena*, and *C. nebulosus*) have retained it. The retention of the scapula, along with the simple urohyal, may represent the generalized condition in *Callechelys*. The similarity of the New World forms, as well as their dissimilarity to other Indo-west Pacific species, strongly suggests a common ancestry prior to the closure of the middle American seaway. *C. galapagensis* appears most similar to the central Pacific *C. luteus* Snyder, but differs in having fewer vertebrae, a deeper body, and a spotted anal fin. (Snyder (1904: 517) described the type as having "fins colored like the body"; our specimen, SIO 68-497, 1038 mm, has an unspotted anal fin.) None of the three Atlantic species shows a close resemblance to *C. galapagensis*. On the basis of present evidence we therefore suggest that the three eastern

Pacific species of *Callechelys* have had two separate histories, with one species arising from a Pacific ancestor and the other two with a common New World ancestry.

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LITERATURE CITED

Blache, J. and J. Cadenat

1971. Contribution á la connaissance des Poissons anguilliformes de la côte occidentale d'Afrique. Dixième note: les genre *Myrichthys, Bascanichthys* et *Callechelys* (Fam. des Ophichthidae). Bull. de l'I.F.A.N., ser. A, 33(1): 158-201.

Böhlke, J. E. and J. C. Briggs

1954. *Callechelys cliffi*, a new ophichthid eel from the Gulf of California. Stanford Ichthyol. Bull. 4(4): 275-278.

Fowler, H. W.

1932. The fishes obtained by the Pinchot South Seas Expedition of 1929, with descriptions of one new genus and three new species. Proc. U.S.N.M., 80(6): 1-16.

1938. The fishes of the George Vanderbilt South Pacific Expedition, 1937. Zool. results, part 3. Monog. Acad. Nat. Sci. Philadelphia, no. 2. 349 p.

Ginsburg, I.

1951. The eels of the northern Gulf coast of the United States and some related species. Texas J. Sci. 3(3): 431-485.

Gosline, W. A.

1951. The osteology and classification of the ophichthid eels of the Hawaiian Islands. Pacific Sci. 5(4): 298-320.

Kanazawa, R. H.

1952. More new species and new records of fishes from Bermuda. Fieldiana, Zool. 34(7): 71-100.

Kaup, J. J.

1856. Catalogue of apodal fish, in . . . the British Museum. London, 163 p.

Nelson, G. J.

1966. Gill arches of teleostean fishes of the order Anguilliformes. Pacific Sci., 20(4): 391-408.

Pellegrin, J.

1912. Sur une collection de poissons des Nouvelles-Hébrides du Dr. Cailliot. Bull. Mus. Hist. Nat., Paris, 18(4): 205-207.

Smith, J. L. B.

1957. The fishes of Aldabra. Part IX. (with a new eel from East Africa). Ann. Mag. Nat. Hist., ser. 12, 10:833-842.

1962. Sand-dwelling eels of the Western Indian Ocean and the Red Sea. Rhodes Univ. Ichthyol. Bull. 24: 447-466.

Snyder, J. O.

1904. Catalogue of the shore fishes collected by the Steamer Albatross about the Hawaiian Islands in 1902. Bull. U.S. Fish Comm., Vol. 22 for 1902: 513-538.

Storey, M. H.

1939. Contributions toward a revision of the ophichthyid eels. I. The genera *Callechelys* and *Bascanichthys*, with descriptions of new species and notes on *Myrichthys*. Stanford Ichthyol. Bull., 1(3): 61-84.

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